

## FINDINGS AND RECOMMENDATIONS

Findings and recommendations are presented below to answer the questions asked of the Fire Investigative Team in the delegation of authority. Findings and recommendations cover planning, implementation, and qualifications.

### Planning

#### **1. Was the prescribed fire plan adequate given the complexity, objectives, and environmental conditions, and did it comply with guidance set forth in Director's Orders-18 and Reference Manual-18, which are NPS documents for policy and direction on fire management?**

The investigation has found that the prescribed fire plan was not adequate.

**Finding A:** The complexity rating process completed for the Upper Frijoles 1 and 5 (Cerro Grande) prescribed fire plan did not follow the National Park Service rating system. The range of numeric ratings assigned by Bandelier, i.e., 1,2,3, did not comply with the Worksheet Numeric Rating Guide in RM-18, which has a numeric ratings range of 1,3,5 (USDI National Park Service 1988b). This error in and of itself resulted in the prescribed fire being rated as low-moderate complexity (87) by Bandelier staff rather than moderate-high (137) when the correct values were used.

**Recommendation:** Agencies must ensure that complexity rating systems are used properly.

**Finding B:** There are different prescribed fire complexity rating systems being used by different agencies, and within the southwest geographic area there are no standard systems among agencies.

**Recommendation:** Agencies should jointly develop and use interagency complexity rating standards for specific geographic areas rather than agency-wide standards.

**Finding C:** A number of the prescribed fire complexity elements in the rating guide were consistently underrated based on the investigation team review. This underrating coupled with the apparent misuse of the system identified in Finding A resulted in a significant misclassification of the complexity. An analysis of where each complexity element was underrated is shown in Table 1.

**Recommendation:** Implement in the plan review process, a specific checklist that indicates review of the complexity rating. Ensure that all prescribed fire planners and reviewers are trained in how to accurately use the complexity standards in the complexity rating system.

**Table 1. The analysis of the underrated complexity elements. (Worksheet Numeric Rating Guide in RM-18)**

|                                       |   |
|---------------------------------------|---|
| <b><i>Safety</i></b>                  | <ul style="list-style-type: none"> <li>• The burn unit's fireline was unanchored.</li> <li>• There was no hand line along the boundary of adjacent landowner (Baca Ranch).</li> <li>• No escape routes were identified.</li> <li>• Incident action plan did not conform to National Wildfire Coordinating Group standards.</li> <li>• Staff not available for extended periods; 0200-0300 crew's relief created personnel shortage.</li> <li>• Inadequate staffing resulted in extended hours and extreme shift periods lasting 12 hours prior to ignition .</li> <li>• Spot weather forecast was issued at 1220; ignition was 1930. Weather observations were taken at Cerro Grande Summit the morning of May 4, up to 11 am. No further weather observations were taken until 1735.</li> <li>• Weather observations were in compliance. Holding Specialist had a telephone consultation with the NWS at 1900.</li> <li>• Two single resources were not on the fire and not briefed; dealing with a flare up on another prescribed fire in park.</li> <li>• No resources were identified to relieve current personnel assigned to the fire and the plan was unclear as to where the fire would be stopped.</li> <li>• Costs were an issue; as an AD crew, the Black Mesa Crew could only be used 24 hours prior to ignition and 24 hours after being taken off active assignment. Cost preparation for the unit had not been completed.</li> <li>• The complexity of the fire exceeded the management capability of the organization.</li> </ul> |
| <b><i>Threats to the Boundary</i></b> | <ul style="list-style-type: none"> <li>• State of New Mexico and U.S. Forest Service did not have an agreement with Bandelier to allow prescribed fire on those properties.</li> <li>• High probability of spot fires given that the prescription calls for flame lengths at 9 feet with consumption and torching of overstory trees.</li> <li>• Boundaries had continuous fuels requiring line construction to keep fire from crossing.</li> </ul>   |
| <b><i>Fuels and Fire Behavior</i></b> | <ul style="list-style-type: none"> <li>• All aspects except the north were presented within the burn area.</li> <li>• Variable slope conditions were 0 to 20%.</li> <li>• Five fuel types with variable loading (grasses composed of two different fuel types).</li> <li>• Potentially long duration fire unless the fire is extinguished and totally mopped up.</li> <li>• Drought index indicates moderate drought and is expected to continue</li> </ul>   |

|   |  |
|---|--|
| <b><i>Objectives</i></b>  | <ul style="list-style-type: none"> <li>• This prescribed fire was an action to restore a fuel situation</li> <li>• Objectives required a different treatment for each of the fuel types present in the burn unit, e.g. varying firing intensities required to achieve objectives.</li> <li>• Fire spotting objective under one quarter mile is invalid due to lack of agreements with adjacent landowners.</li> </ul>      |
| <b><i>Management Organization</i></b>                           | <ul style="list-style-type: none"> <li>• Multiple resource incident; fire plan identified helicopters, crews, engines, and monitors which dictated an ICT3 organization, not an ITC4.</li> <li>• multiple operational periods requiring shifting of command and briefing and debriefing of resources at change of command.</li> </ul>  |
| <b><i>Protection of Natural, Cultural and Social Values</i></b> | <ul style="list-style-type: none"> <li>• Dealing with multiple threatened and endangered species requires mitigations and constraints on operations.</li> <li>• As identified in burn units 1 and 5, cultural resource inventory dated July 1999, numerous cultural and historical resources were identified for protection as part of the project.</li> <li>• Research plots requiring protection</li> </ul>              |
| <b><i>Logistics</i></b>   | <ul style="list-style-type: none"> <li>• Duration of support is in multiple phases requiring multiple operational periods</li> <li>• Access is only to the bottom of the burn unit with the top of the burn unit being 1,100 feet in elevation, accessible only by foot</li> <li>• High external interest and concern</li> <li>• Some impact on neighbors and visitors due to operations adjacent to the road</li> </ul>   |
| <b><i>Political Concerns</i></b>                                | <ul style="list-style-type: none"> <li>• No provisions to manage media on the fire</li> </ul>  |
| <b><i>Tactical Operations</i></b>                               | <ul style="list-style-type: none"> <li>• Complex firing patterns dependant upon local weather and fuel conditions.</li> <li>• Simultaneous use of multiple firing sequences.</li> <li>• Aerial support for mitigating actions desirable.</li> <li>• Simultaneous actions were critical to accomplishment of objectives.</li> <li>• Multiple mitigation actions at various locations spread throughout the fire.</li> </ul> |
| <b><i>Interagency Coordination</i></b>                          | <ul style="list-style-type: none"> <li>• High competition for resources due to suppression of wildland fires within the zone.</li> <li>• Los Alamos National Laboratory concerns relative to prescribed fire.</li> </ul>   |

**Finding D:** The prescribed fire plan was not substantively reviewed before it was approved by the agency administrator (Superintendent).

**Recommendation:** The prescribed fire plan must be reviewed by the unit fire management officer and an appropriate off-unit technically qualified reviewer.

**Finding E:** The prescribed fire planner did not receive sufficient oversight, guidance, and support to prepare the prescribed fire plan.

**Recommendation:** The Board of Review must consider accountability as discussed in the Federal Wildland Fire Management Policy and Program Review to determine appropriate actions with respect to this prescribed fire (USDA Forest Service and DOI 1995, page 30).

**Finding F:** The prescribed fire plan prescription was inadequate for all phases of the burn due to wide elevation variations, varying aspects, and different fuel types. The prescription necessary to meet objectives at the upper elevations would cause unacceptable resource damage on the lower elevation of the burn unit.

**Recommendation:** Agencies should ensure that within landscape scale projects there are separate and distinct prescriptions for each fuel model.

**Finding G:** The prescribed fire plan prescription projected flame lengths in excess of the limits set in the Bandelier NM Fire Management Plan.

**Recommendation:** Prescribed fire plans must be consistent with fire management plans.

**Finding H:** Bandelier National Monument personnel did not receive or solicit comments from all cooperating agencies in the planning process. After the incident, cooperating agencies expressed concern about the decision to ignite the prescribed fire.

**Recommendation:** The Federal Wildland Fire Management Policy and Review requires coordination (USDA Forest Service and DOI 1995, Guiding Principles). To strengthen the existing policy we recommend that each prescribed fire plan be reviewed by all adjacent land and/or fire managers and concurred by signature. If not concurred, then the project must be modified such that the maximum manageable area (the area that could be burned in prescription) excludes such other property or jurisdictions.

**Finding I:** The prescribed fire plan amendment prepared the day of the burn did not consider the full consequences of the changes and actions necessary for successful completion and coordination of the prescribed fire.

**Recommendation:** Any amendment must go through the same review, approval, and notification process as the original plan.

**Finding J:** The contingency plan inadequately identified actions needed to keep the prescribed fire within the prescribed parameters and necessary actions to be taken if it escaped.

**Recommendation:** Agencies should jointly develop prescribed fire implementation policy that requires Wildland Fire Situation Analysis alternatives for the lands adjacent to the prescribed fire unit, and include the alternatives in the contingency plan.

## **Implementation**

### **2. Were the prescription, actions, and procedures set forth in the prescribed fire plan followed?**

There were a number of critical deviations from the prescription, actions, and procedures set forth in the prescribed fire plan, as well as standard fire practices.

**Finding A:** The “Go-No Go” checklist was not completed prior to the burn.

**Recommendation:** This critical checklist must be completed so the prescribed fire burn boss can make the appropriate decision to proceed or not proceed with the burn.

**Finding B:** Contingency resources were not ordered and placed on standby prior to implementation of the prescribed fire.

**Recommendation:** Contingency resources identified in the plan should be ordered through normal wildland fire procedures to ensure their availability.

**Finding C:** On the early morning of May 5, USDA Forest Service contingency resources were ordered and did not arrive until approximately 1100 hours. Lateness of arrival of contingency resources influenced control of an isolated spot fire but did not effect the escape of the fire.

**Recommendation:** Federal agencies must resolve the inconsistency regarding the use of contingency resources. Some believe contingency resources are to keep prescribed fire within burn boundaries, while others believe that contingency resources are only ordered when the prescribed fire escapes.

**Finding D:** Once the prescribed fire was declared a wildfire, wildland fire suppression tactics were used that were not in accordance with the Wildland Fire Situation Analysis. This resulted in additional fire being introduced into the unit, which ultimately produced the source of spotting and escape when high winds developed on Sunday, May 7.

**Recommendation:** Fire operations must not deviate from the strategies and tactics identified in the current Wildland Fire Situation Analysis.

**Finding E:** Numerous safety violations occurred, i.e., unanchored fireline, unheeded work rest guidelines, aviation SAFECOM, lack of identified escape routes and others.

**Recommendation:** Firefighter and public safety is the highest management consideration. The Board of Review must consider the safety policy discussed in the Federal Wildland Fire Management Policy and Program Review to determine appropriate actions (USDA Forest Service and DOI 1995, page 20).

**Finding F:** The weather forecast from Albuquerque on Friday afternoon, May 5, fire did not provide any wind predictions in the 3-5 day forecast for the period Sunday, May 7 through Tuesday, May 9. This is a period with area wind gusts greater than 30 mph on both Sunday and Monday. This information is critical for multi-day incidents.

**Recommendation:** The National Weather Service must follow policy to provide wind information in the extended portion of the fire weather forecast. If information is not provided in the forecast, fire personnel must immediately request such information.

**Finding G:** There are a significant number of other issues with regard to coordination and use of National Weather Service forecasting in the implementation in the prescribed fire. These issues and recommendations are identified below:

**Issue 1:** Moderate drought existed in northern New Mexico and surrounding regions in the spring of 2000, having built since the fall of 1999. NPS did not adequately account for the effects of this drought in planning or implementing the Cerro Grande prescribed fire.

**Recommendation:** Effects of long-term drought must be factored into prescribed fire planning and implementation.

**Issue 2:** Light precipitation fell at the burn site on April 29 thru May 1. However, the prevailing warm, dry pattern under a ridge of high pressure aloft returned on May 2.

**Recommendation:** None

**Issue 3:** The NPS followed policy in asking for, receiving, and making use of a site-specific (spot) weather forecast from the National Weather Service Forecast Office in Albuquerque for the Cerro Grande Prescribed Fire.

**Recommendation:** Continue policy of requiring spot forecast for all site-specific applications (consistent with the recommendation under Finding D).

**Issue 4:** On the night of May 4 and the morning of May 5, the Haines Index, which is a measure of atmospheric stability and dryness and indicates the potential for large fire growth, did not contribute to the escape of the Cerro Grande Prescribed Fire.

**Recommendation:** Wildland fire management agencies need to jointly review the usefulness of the Haines Index.

**Issue 5:** Onsite weather observations provided by the NPS for the Cerro Grande Prescribed Fire on May 4 and 5 were generally well covered in the spot forecast provided by the National

Weather Service.

**Recommendation:** Continue to utilize onsite weather observations during wildland and prescribed fires to validate and improve weather forecasting capabilities.

**Issue 6:** The 11 mph wind gust that occurred during the late evening hours of May 4<sup>th</sup> was at ridge-top level and was within forecast ridge-top wind speeds provided by the National Weather Service.

**Recommendation:** None

**Issue 7:** The standards for wind speed measurements used in National Fire Danger Rating System (NFDRS) fire weather observations are: 1) the anemometer height is 20 feet above the surface, or 20 feet above the vegetative cover, and 2) the standard observation time is 10 minutes. These standards often cause confusion among fire personnel, who don't measure 10 minute or 20-foot winds.

**Recommendation:** Standardize all non-NFDRS observed and forecast winds to the 20-foot level and two-minute average. We suggest that a study be undertaken to evaluate the use of two-minute winds in NFDRS.

**Issue 8:** The NWS Albuquerque practices regarding Fire Weather Watches and Red Flag Warnings may have caused some confusion. Some Fire Weather Watches and Red Flag Warnings did not specify affected areas, cause, and valid period.

**Recommendation:** All fire weather forecast offices should follow policy and include this information on all Fire Weather Watches and Red Flag Warnings for every zone or grouping of zones forecast.

**Issue 9:** Red Flag Warnings can remain in effect for more than 24 hours for continuous wind events.

**Recommendation:** Red Flag Warnings should remain in effect until the weather pattern causing the Red Flag conditions no longer exists.

**Issue 10:** At times fire management personnel did not have a current spot forecast because the burn boss at the incident had set up no regular schedule for spot forecasts.

**Recommendation:** The prescribed fire plan needs to establish a regular schedule for obtaining spot forecasts.

**Issue 11:** After May 4, there was a decrease in communications and feedback between the NPS fire management personnel and NWS forecasters in Albuquerque.

**Recommendation:** Fire management personnel and fire weather forecasters need to be pro-active in establishing and maintaining adequate communications throughout an incident.

The prescribed fire plan needs to include this requirement.

**Issue 12:** The Incident Action Plan (IAP) for Sunday, May 7 did not include a weather forecast for the day operational period.

**Recommendation:** Incident Management Teams must ensure IAPs include a weather forecast for the current operational period.

**Finding H:** Conditions adjacent to the prescribed fire boundary were not given adequate consideration with regard to fire behavior, fuel conditions, and public safety in the event the fire crossed the planned burn boundaries.

**Recommendation:** Agencies should jointly develop prescribed fire implementation policy that requires Wildland Fire Situation Analysis alternatives for the lands adjacent to the prescribed fire unit, and include the alternatives in the contingency plan. (Same as recommendation 1-J above.)

**Finding I:** The current wildland fire situation in the Southwest was not given full consideration when the prescribed fire was initiated.

**Recommendation:** Before the decision is made to implement a prescribed fire, the geographic area preparedness level must be considered, and there must be appropriate coordination with the Geographic Area Coordination Center based on the preparedness level.

**Finding J:** The preparedness level coordination and allocation of resources for all wildland fire use is not adequately addressed in the Southwest Geographic Area Mobilization Guide.

**Recommendation:** Preparedness level coordination and allocation of resources for all wildland fire use should be addressed in the Southwest Geographic Area Mobilization Guide, specifically strengthening the criteria for prescribed fire.

**Finding K:** Actions taken to notify cooperating agencies and interested parties of this prescribed fire did occur within the time frame specified in the prescribed fire plan. The communications that did happen on May 4, however, did not adequately reflect the complexity and full nature of the prescribed fire about to be undertaken.

**Recommendation:** Appropriate pre-notification and communication with adjacent land owners, interested and concerned parties, and other agencies should be undertaken as specified in the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (USDA Forest Service and DOI 1998, page 69).

## **Qualifications**

### **3. Were prescribed fire training and experience of personnel involved commensurate with agency qualification standards?**

All personnel met existing National Wildfire Coordinating Group standards.



**Finding A:** The technical and operational experience of the burn boss was not adequate to plan and conduct the prescribed burn given its true complexity.

**Recommendation:** Unit managers will review individual wildland fire qualifications to ensure that technical and operational skills and experience are commensurate with the fuel and project complexity.

**Finding B:** Personnel implementing this prescribed fire met established National Wildfire Coordinating Group standard for tasks performed on the fire.

**Recommendation:** None

## CONCLUSIONS

On May 4, 2000, Bandelier National Monument fire management personnel ignited a prescribed burn, Upper Frijoles 1&5, which has become known as the Cerro Grande Prescribed Fire, near the summit of Cerro Grande. This prescribed fire was based upon a flawed plan and required fire management policies were not followed. This fire progressed without problems until on May 5 at approximately 1300 hours when slopover and spotting resulted in the burn boss declaring it a wildfire. The wildfire was managed by a Type 3 Incident Management team and staffed by local firefighters until May 7. Around noon, stronger than forecasted gusts of wind of up to 50 miles per hour caused the fire activity to increase dramatically. The winds continued to intensify, the fire developed numerous spotfires, and triggered a crown fire. This in turn resulted in extreme fire intensity which fire crews could not attack. A Type I Incident Management Team was ordered and upon arrival, after assessing the condition of the fire and the current management personnel, assumed command.

Based upon a review by the Investigation Team's fire behavior specialists, it is possible that if sufficient contingency resources had been at the burn site on May 5, these resources may have been able to contain the "slop-over" without the need to convert the prescribed burn to a wildfire. If that had occurred the prescribed fire would have progressed to the forest fuels where it is probable that the fire would have slowed or stopped completely. Thus, the fuels would not have been preheated and dried out and no ignition source would have existed to initiate the crown fire that resulted on May 7.

Conclusions of the investigation are as follows:

- The Board of Review needs to consider accountability as described in the Federal Wildland Fire Management Policy and Program Review to determine appropriate actions to address the overall findings of this report (USDA Forest Service and USDI 1995, page 30).
- This incident critically demonstrates the need to continue to provide for firefighter and public safety, and must be given the highest management considerations when managing wildland fire as outlined in the Federal Wildland Fire Management Policy and Program Review (USDA Forest Service and USDI 1995, page 20).
- All agencies must ensure that all administrators are actively involved and committed to the fire management activities. Agency administrators must set the example and establish that wildland and prescribed fire management are critical and of highest importance.
- Agencies must follow all policies set forth in the Federal Wildland Fire Management Policy and Program Review if we are to expect to continue using fire as a critically important management tool to restore natural conditions, maintain forest health, provide wildlife habitat, reduce hazardous fuel buildup, protect watersheds, and improve range condition.
- Agencies must ensure that leaders and managers at all levels set the example in working closely together in planning and implementing fire management activities. Agencies also must ensure that a component of their fire management program includes proactive communication and coordination

with local communities and cooperators. The consequences of not doing so are totally unacceptable.

- The Federal Wildland Fire Management Policy was adopted by the Secretaries of Interior and Agriculture on December 18, 1995. Federal agencies have not fully completed manuals, guidelines, and procedures to fully implement policy along interagency lines. Federal agencies must jointly complete standardization of manuals and procedures to assure consistency of plans and operations to promote cooperation and integrate fire activities across agency boundaries and provide leadership for cooperation with state and local fire management organizations.

## REFERENCES

- Leopold, A.S., S.A. Cain, C.M. Cottam, I.N. Gabrielson, and T.L. Kimball. 1963. Wildlife Management in the National Parks. The Wilderness Society, Washington DC.
- USDA Forest Service and DOI. 1995. Federal Wildland Fire Management Policy and Program Review. Final report. National Interagency Fire Center, Boise, Idaho.
- USDA Forest Service and DOI. 1998. Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide. National Interagency Fire Center, Boise, Idaho
- USDI Bureau of Land Management. 1999. Lowden Ranch Prescribed Fire Review. Final Report. Bureau of Land Management, Department of the Interior.
- USDI National Park Service. 1997. Wildland Fire Management Plan. Bandelier National Monument, New Mexico.
- USDI National Park Service. 1998a. Reference Manual-18 Wildland Fire Management. National Park Service, Washington Office. <http://www.fire.nps.gov/fire/policy/rm18/rm18.htm>
- USDI National Park Service. 1998b. Director's Orders-18 Wildland Fire Management. National Park Service, Washington Office. <http://www.fire.nps.gov/fire/policy/do18/do18.htm>
- USDI National Park Service. 1999. Prescribed Fire Planning, Implementation, and Evaluation Procedures. Memorandum. Washington Office, National Park Service.
- USDI National Park Service. 2000a. NPS Management Policies (Draft). National Park Service, Washington Office.
- USDI National Park Service. 2000b. Bandelier National Monument, Management Ignited Prescribed Fire Burn Plan, Burn Unit—Upper Frijoles 1 and 5. Bandelier National Monument, New Mexico.